

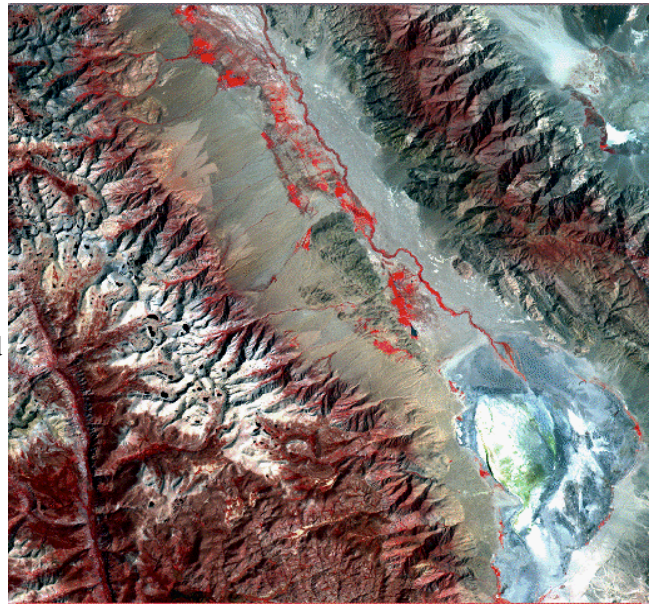
## LCLUC Abstract

### The Dynamics of a Semi-Arid Region in Response to Climate and Water-Use Policy

<[http://www.planetary.brown.edu/planetary/LCLUC\\_Owens/](http://www.planetary.brown.edu/planetary/LCLUC_Owens/)>

John Mustard

We propose to investigate the modes of response of land cover units in Owens Valley to recent environmental stress related to both climatic (drought between two wet periods) and social (high volume groundwater extraction during the drought period) factors. The land cover of the Owens Valley consists of shrub communities on the bajada surfaces flanking the valley floor, and a mosaic of shrub land, phreatophyte and riparian communities, agricultural, and developed land on the valley floor. Although the entire valley was affected by a drought from 1987 to 1992, only the southern reaches of the valley floor were directly affected by groundwater pumping to supply water to the city of Los Angeles. This matrix of temporally variable water availability and spatially distinct land-uses provides the ideal environment in which to examine the sensitivity of remotely sensed data for identifying changing vegetation patterns.



Landsat TM data acquired during September of each year from 1985-1996 will be analyzed with a spectral mixture model to quantify the surface abundance of the primary constituents. The September reference frame effectively captures the integrated annual growth of shrubs in this region. These results will then be incorporated into a high resolution GIS data base of the region to assess the modes of response of specific land cover types to the multiple stresses. An existing GIS data base contains extensive information related to land-cover units, changes in vegetation cover, location and amount of groundwater pumping, depth to water table over time, and other key information. The remotely sensed data provide the essential scaling information necessary for investigating these modes over much larger areas and in specific locations than is possible from the field surveys. Since there exist a number of ecological and land cover units, and differences in the amount of groundwater pumping between the southern and northern sections of the valley, a number of responses will be investigated. Due to a decline in the ecological health of phreatophyte communities during the drought, a policy change was affected in the amount and timing of groundwater withdrawal. This allows us to assess the effectiveness of this policy change on ecosystem response, changes in species composition, and productivity. The proposed work represents a well controlled case study of land degradation in a semi-arid environment. The combination of physical and social drivers results in multiple stress which have affected land cover and ecological responses. The proposed study will provide insight into the vulnerability of semi-arid regions to a combination of anthropogenic stresses, management strategies, and climate variability.